Supplementary Material

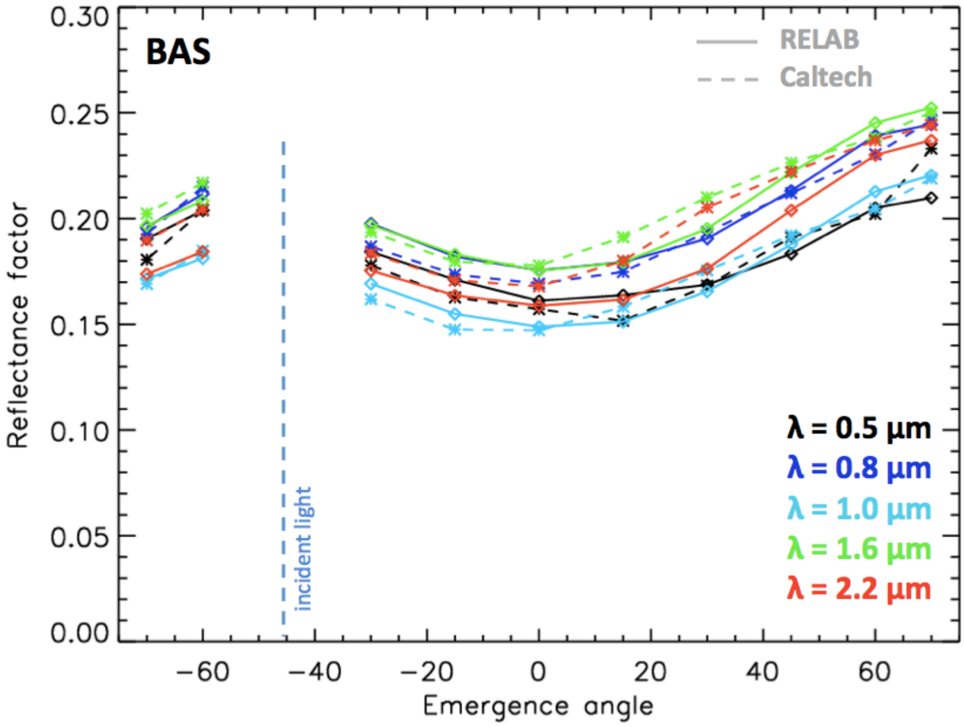

Fig 1sup: Photometric curves obtained with the basalt sample (BAS) for a few wavelengths. Results obtained with the RELAB spectro-goniometer setup are in solid lines and results obtained with the Caltech spectro-goniometer setup are in dashed lines. Differences are within 5-10% in reflectance and likely due to differences in sample packing, flatness and/or spot size.

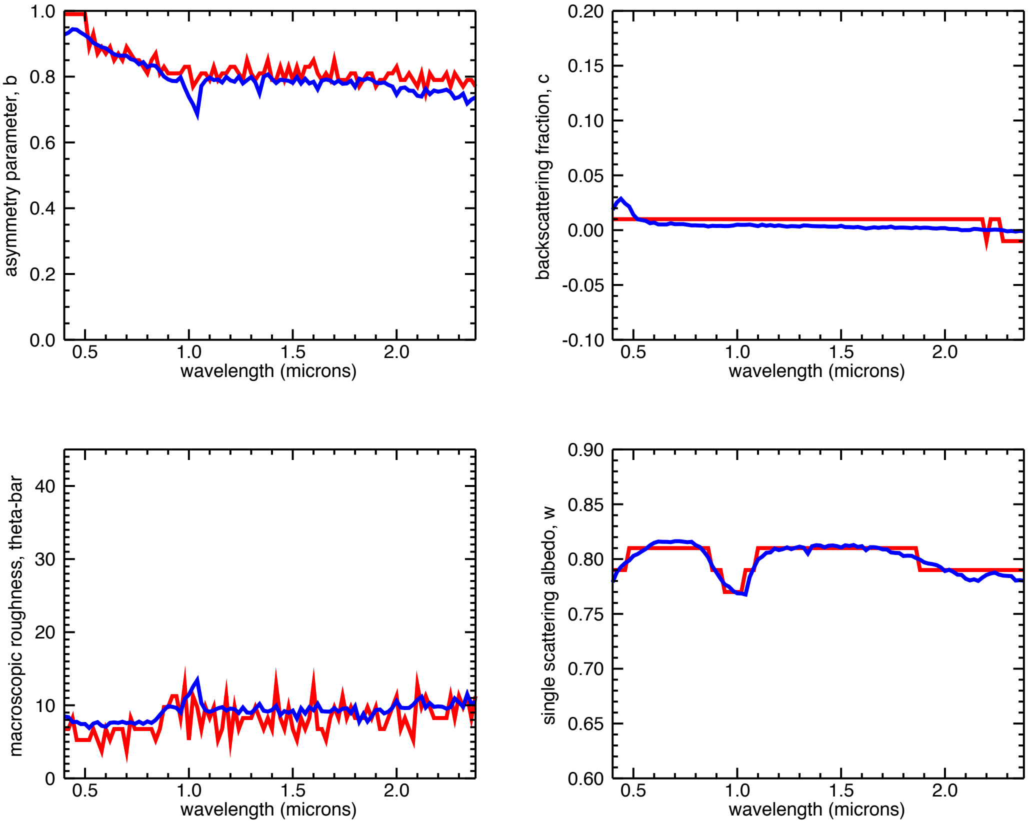

Fig 2sup: Derived photometric parameters for the basalt sample (BAS) as a function of the wavelength from 0.4 µm to 2.5 µm. In blue: mean of the PDF. In red: maximum of frequency histogram (mode) derived from the PDF using a sampling bin of 0.02 for parameter b, c and ω and 1.5 for parameter θ-bar.

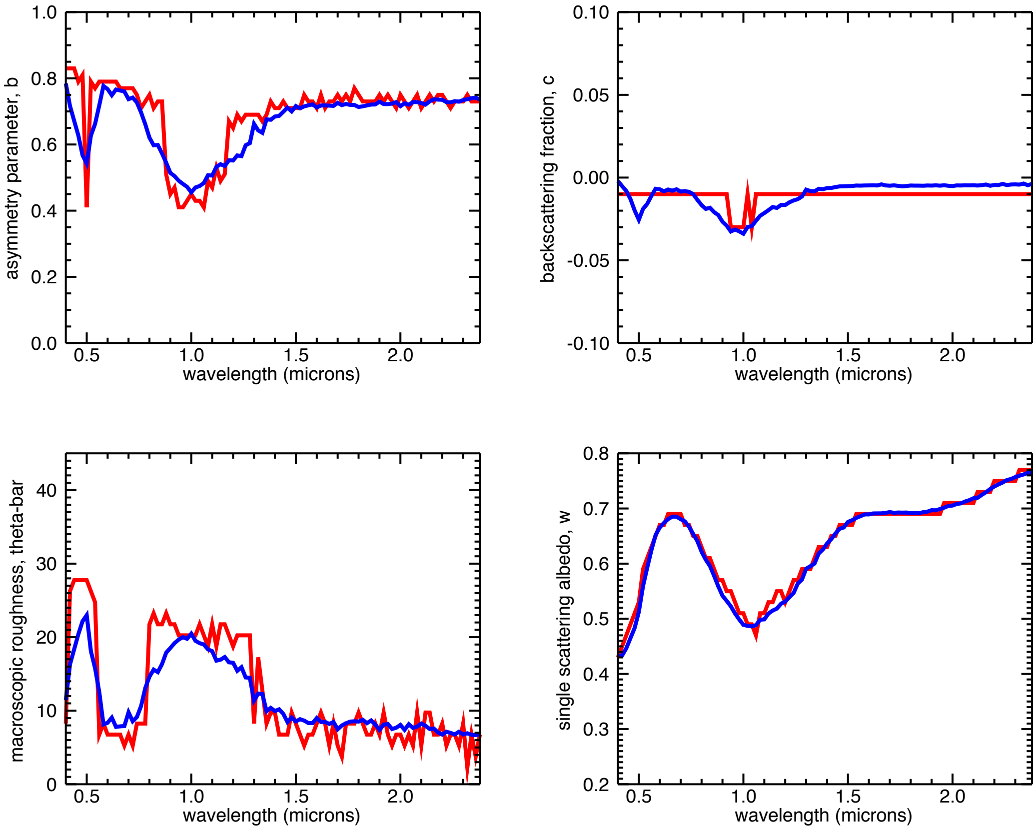

Fig 3sup: Derived photometric parameters for the basaltic glass sample (BasGl) as a function of the wavelength from 0.4 µm to 2.5 µm. In blue: mean of the PDF. In red: maximum of frequency histogram (mode) derived from the PDF using a sampling bin of 0.02 for parameter b, c and ω and 1.5 for parameter θ-bar.

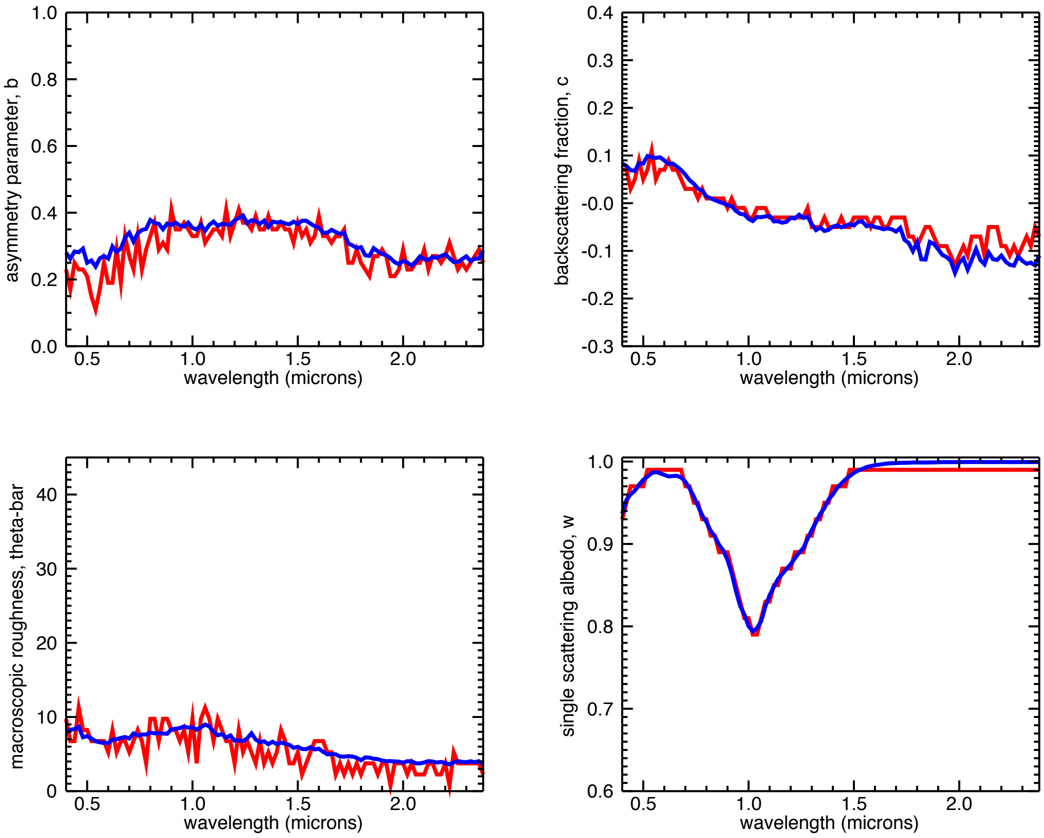

Fig 4sup: Derived photometric parameters for the olivine sample (OLV) as a function of the wavelength from 0.4 µm to 2.5 µm. In blue: mean of the PDF. In red: maximum of frequency histogram (mode) derived from the PDF using a sampling bin of 0.02 for parameter b, c and ω and 1.5 for parameter θ-bar.

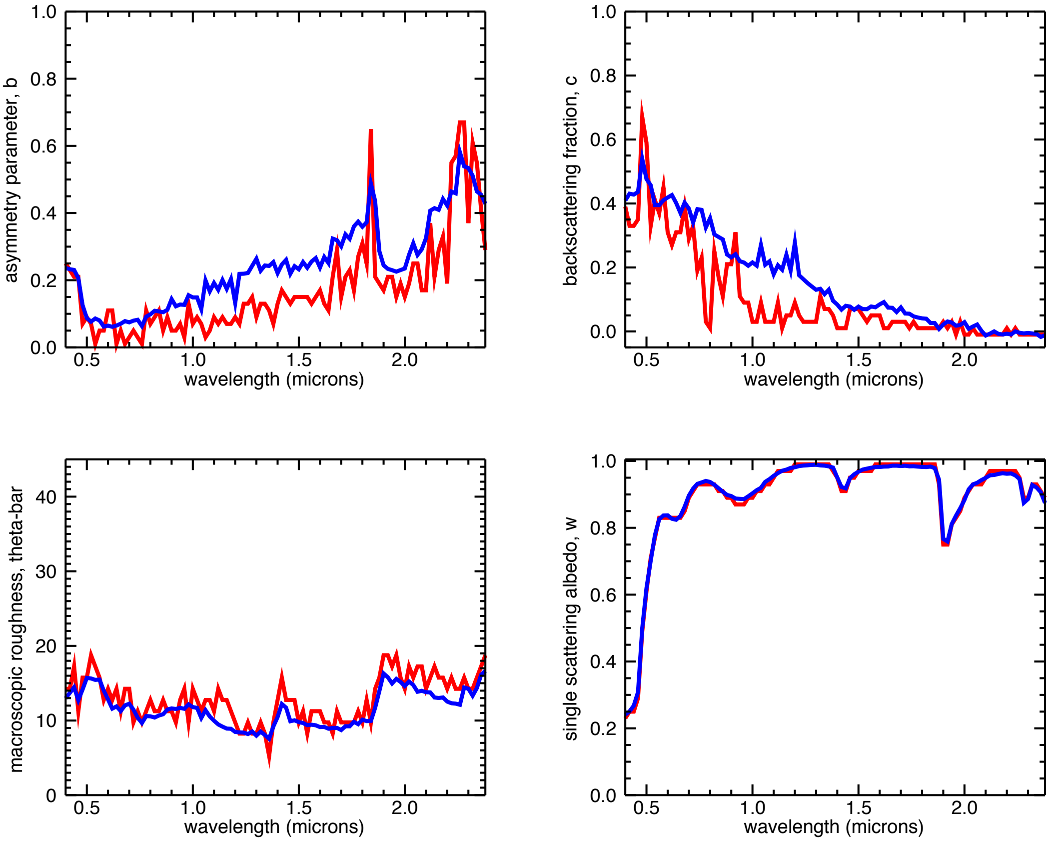

Fig 5sup: Derived photometric parameters for the nontronite sample (NG1) as a function of the wavelength from 0.4 µm to 2.5 µm. In blue: mean of the PDF. In red: maximum of frequency histogram (mode) derived from the PDF using a sampling bin of 0.02 for parameter b, c and ω and 1.5 for parameter θ-bar.

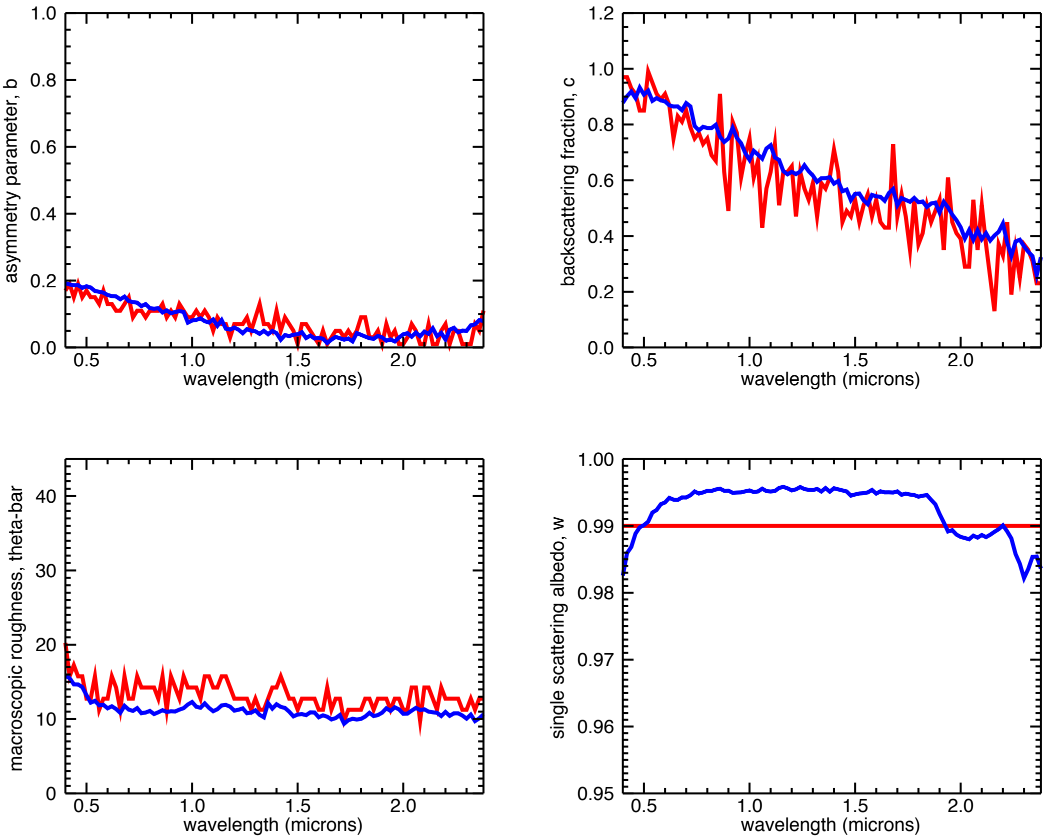

Fig 6sup: Derived photometric parameters for the magnesite sample (MGC) as a function of the wavelength from 0.4 μm to 2.5 μm. In blue: mean of the PDF. In red: maximum of frequency histogram (mode) derived from the PDF using a sampling bin of 0.02 for parameter b, c and ω and 1.5 for parameter θ-bar.

Description: parameter solution and representation

The final solution of the Bayesian inversion for each model parameter is a chain (i.e., Markov chain) composed of 500 possible solutions. To describe the solution, we can use different estimators. The common estimators are the mean and the mode (value obtained for the maximum of the PDF) (e.g., Fernando et al. 2013, 2015, Schmidt and Fernando 2015). The mean is directly calculated from the solution chain. The mode is estimated from the frequency histogram, which depends on the number of classes, chosen from the number of chain solutions. Because the chain is composed of 500 solutions here, the best trade-off for the sampling bin is 0.02 for the parameter ω, b, and c and 1.5 for parameter θ-bar. The sampling bin can be reduced by increasing the number of iterations in the Bayesian inversion in order to have a wider collection of solution but with an increase of computation time.

Because all posterior distribution for the parameters b, c, ω, and θ-bar are unimodal (indicating only one probable solution) due to well sampled data (i.e., well sampled emission angles in the principal plane) (Schmidt and Fernando 2015), the consistency between the mean and mode values shows that the posterior PDF is close to a Gaussian distribution, which shows that the mean and mode are good estimators of the solution. However, because the mode includes an imprecision in its estimation depending to the sampling bin of the frequency histogram, the mean is used here to describe the model parameter solutions.